

### REMARKS

Claims 1-20 were pending in the application. By this paper, Applicant has cancelled Claims 2, 6, and 19 without prejudice, amended Claims 1, 7, 11, 15 and 20, and added new Claims 21-30. Accordingly, Claims 1, 3-5, 7-18, and 20-30 are presented herein for examination.

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#### *Objected-to Subject Matter*

Per Par. 16 of the Office Action, Claims 8-10 were objected to as being dependent on a rejected base claim, but otherwise allowable if recast in independent form. By this paper, Applicant has recast Claims 8 and 9 as new independent Claims 27 and 28, respectively. New  
10 Claim 29 corresponds to Claim 10. Applicant submits that these new claims add no new matter, and overcome the Examiner's objections.

#### *Drawing Objections*

In response to the Examiner's objections to the drawings set forth in Pars. 2-4 of the  
15 Office Action, Applicant submits herewith both proposed drawing amendments (i.e., marked-up or redlined drawings) and replacement sheets for Figs. 3 (part 1 of 2), 3b, 6, 7a, 10b and 10c. Regarding Par. 3, Applicant notes that reference to Fig. 10d has been deleted from the specification by this paper.

Applicant submits that these amendments overcome all of the Examiner's objections.

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#### *Amendments to the Specification*

By this paper, Applicant has amended various portions of the specification to correct minor editorial deficiencies, both those cited by the Examiner and identified by Applicant. No new matter has been added by way thereof.

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#### *§112 Rejections*

Per Pars. 5-6 of the Office Action, Claims 6 and 19-20 were rejected under Section 112, second paragraph, for being indefinite. By this paper, Applicant has cancelled Claim 6 without prejudice, thereby rendering this rejection moot. Applicant has also amended Claim 20,  
30 cancelled Claim 19 without prejudice, and reformulated Claim 19 as new Claim 21, which

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Applicant believes more clearly shows the relationship between the modulator and digital processor (see also Applicant's drawing amendments, which reflect this change). Applicant submits that these amendments add no new matter, since the functional relationships between the various components were described in detail in the specification as filed.

5 Accordingly, Applicant submits that all of the Examiner's Section 112 rejections have been overcome.

*§102 Rejections*

10 **Claim 1** - Per Pars. 8 and 9 of the Office Action, independent Claim 1 was rejected under Section 102 as being anticipated by Liu ("Observation of Coherent...") and Eberly (U.S. 4,406,003). By this paper, Applicant has amended Claim 1 to include limitations relating to (i) the recited communication apparatus being a data communication apparatus (including a plurality of data bits), and (ii) the recited atomic medium storing quantum state information that  
15 can be subsequently read out therefrom.

Applicant submits that Liu in no way teaches or suggests using the recited elements of Claim 1 for storing or transmitting a plurality of data bits (Applicant respectfully traverses the Examiner's assertion that Liu even teaches a communication apparatus of *any* kind, let alone one adapted for transmitting a plurality of data bits), and hence cannot render Claim 1 anticipated.

20 Applicant further submits that Eberly in no way teaches or suggests storing quantum state information in the medium that can be subsequently read out therefrom. To the contrary, Eberly teaches a system and method wherein light "pulses" of differing wavelengths are passed through a medium so as to cause them to travel at the same speed, which is reduced from their normal propagation speed:

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30 *"In accordance with the invention, a number of different pulse beams, each at a different wavelength (e.g., different colors for optical pulses) and/or polarization may be caused to travel at the same speed, rather than at different speeds for each wavelength. In accordance with the invention, also, the transmission properties are different when some pulses (e.g., some of the colors) are absent and when some of the pulses are present."* Col. 1, lines 18-25 {Emphasis added}

Eberly does not appear to teach or suggest storage of quantum state information in the medium itself (e.g., for a period of time), and subsequent readout therefrom. Herein lies a fundamental distinction between Eberly and Applicant's invention of Claim 1; i.e., Eberly merely seeks to match the propagation speeds of different (chromatic) pulses through the medium, whereas  
5 Applicant's claimed invention stores state information in the medium for subsequent readout.

Applicant further notes that Eberly clearly teaches away from combination with Liu, since, *inter alia*, Eberly teaches heating (excitation) of its medium, which would not permit storage of quantum state information for a period of time as in Applicant's invention.

10 *"The medium can be excited, so that its energy levels are populated to some degree, by an excitation unit 14 such as a heater or a flash lamp or another laser." Col. 3, lines 52-54 {Emphasis added}*

Accordingly, Applicant submits that Claim 1 as amended herein is neither anticipated nor  
15 rendered obvious by Liu or Eberly, taken alone or in combination.

**Claims 7 and 11** - Per Par. 9 of the Office Action, independent Claims 7 and 11 were rejected under Section 102 as being anticipated by Eberly (U.S. 4,406,003). By this paper, Applicant has amended Claim 7 to include limitations relating to (i) the recited communication  
20 system being a data communication system, and (ii) the recited act of irradiating the atomic medium with the first electromagnetic radiation storing at least part of the information therein; and selectively and subsequently irradiating the medium with said second radiation, the second radiation at least in part controlling the readout of the stored information from the medium.

Applicant submits that Eberly in no way teaches or suggests a storage of information in  
25 the medium for a period of time, and then subsequently reading out the stored information by the application of the second radiation. As stated in Eberly with respect to Fig. 1., the excitation unit 14 is merely so that its energy levels of the medium are populated to some degree, a condition maintained during propagation of the pulses through the medium. No mention of using the second radiation to cause a data release or readout is provided that Applicant can find.

30 Generally similar arguments apply for Claim 11 as amended herein.

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Accordingly, Applicant submits that Claims 7 and 11 as amended herein are neither anticipated nor rendered obvious by Liu or Eberly, taken alone or in combination.

**Claim 15** - Per Pars. 10 and 11 of the Office Action, independent Claims 15 was rejected  
5 under Section 102 as being anticipated by Jewel (U.S. 4,741,587) and by Huber (U.S. 5,373,389). By this paper, Applicant has amended Claim 15 to include limitations relating to the recited medium comprising a trapped and cooled medium. Support for this limitation is found at, *inter alia*, page 17 of the specification, discussing Fig. 3. Applicant submits that neither Jewel  
10 Furthermore, Eberly teaches away by heating, as previously discussed.

Accordingly, Applicant submits that Claim 15 as amended herein is neither anticipated nor rendered obvious by Jewel, Huber, Liu or Eberly, taken alone or in combination.

#### *§103 Rejections*

15 Applicant respectfully submits that the Examiner's Section 103 rejections of 3 and 19-20 are rendered moot by Applicant's amendments to the claims as previously described herein.

#### *New Claims*

20 By this paper, Applicant has added new claims (in addition to Claims 27-29 previously discussed). Applicant submits that these new claims are fully supported by the specification as filed, and are novel and non-obvious over the art of record, and hence in condition for allowance.

#### *Other Remarks*

25 Applicant hereby specifically reserves the right to prosecute claims of different or broader scope in a continuation or divisional application.

Applicant notes that any claim cancellations or additions made herein are made solely for the purposes of more clearly and particularly describing and claiming the invention and responding to the aforementioned restriction election, and not for purposes of overcoming art or for patentability. The Examiner should infer no (i) adoption of a position with respect to  
30 patentability, (ii) change in the Applicant's position with respect to any claim or subject matter

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of the invention, or (iii) acquiescence in any way to any position taken by the Examiner, based on such claim cancellations or additions.


Furthermore, any remarks made with respect to a specific claim or claims shall apply only to such claim or claims.

5 If the Examiner has any questions or comments that may be resolved over the telephone, he/she is requested to call the undersigned at (858) 675-1670.

Respectfully submitted,

GAZDZINSKI & ASSOCIATES

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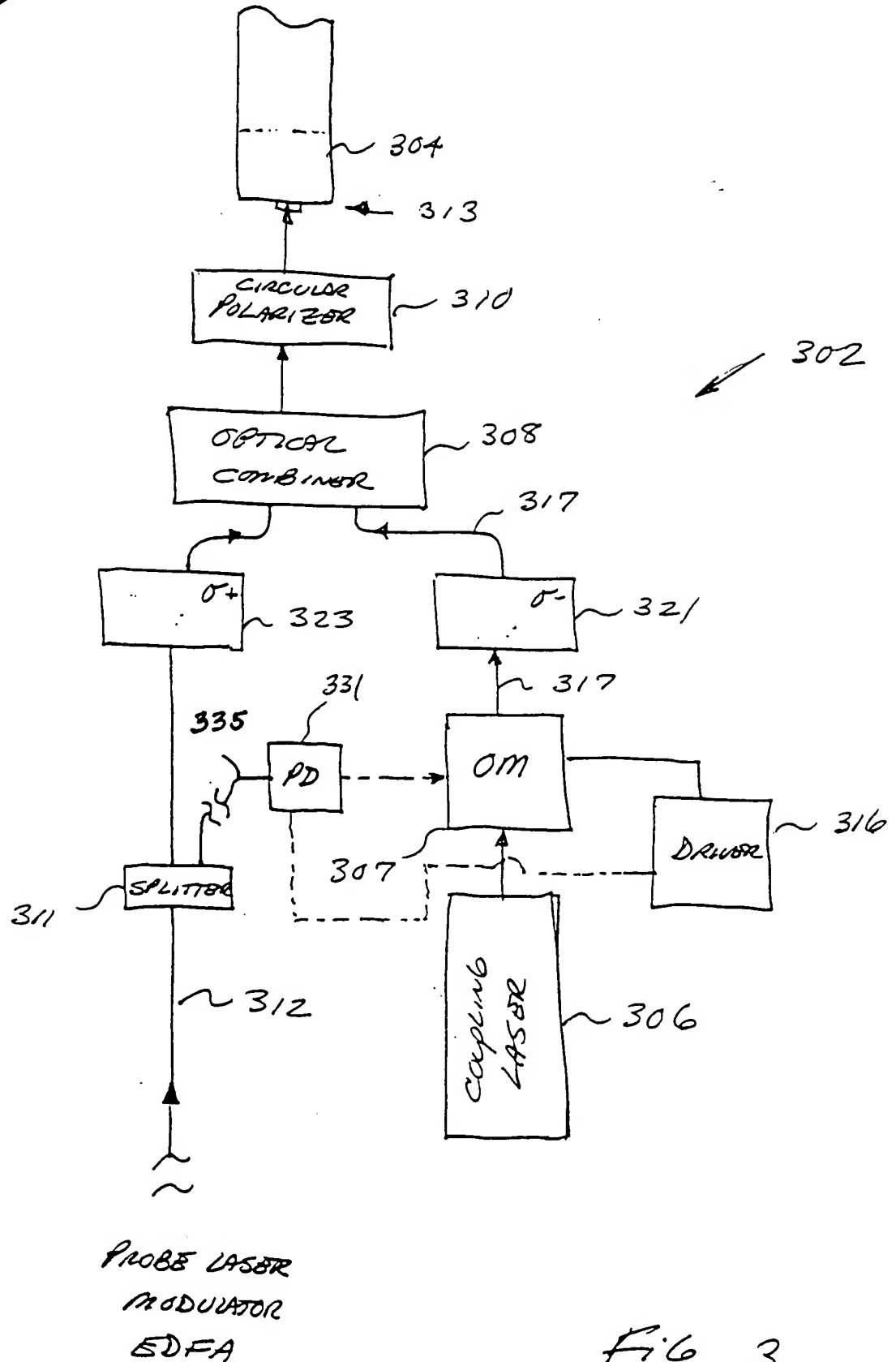
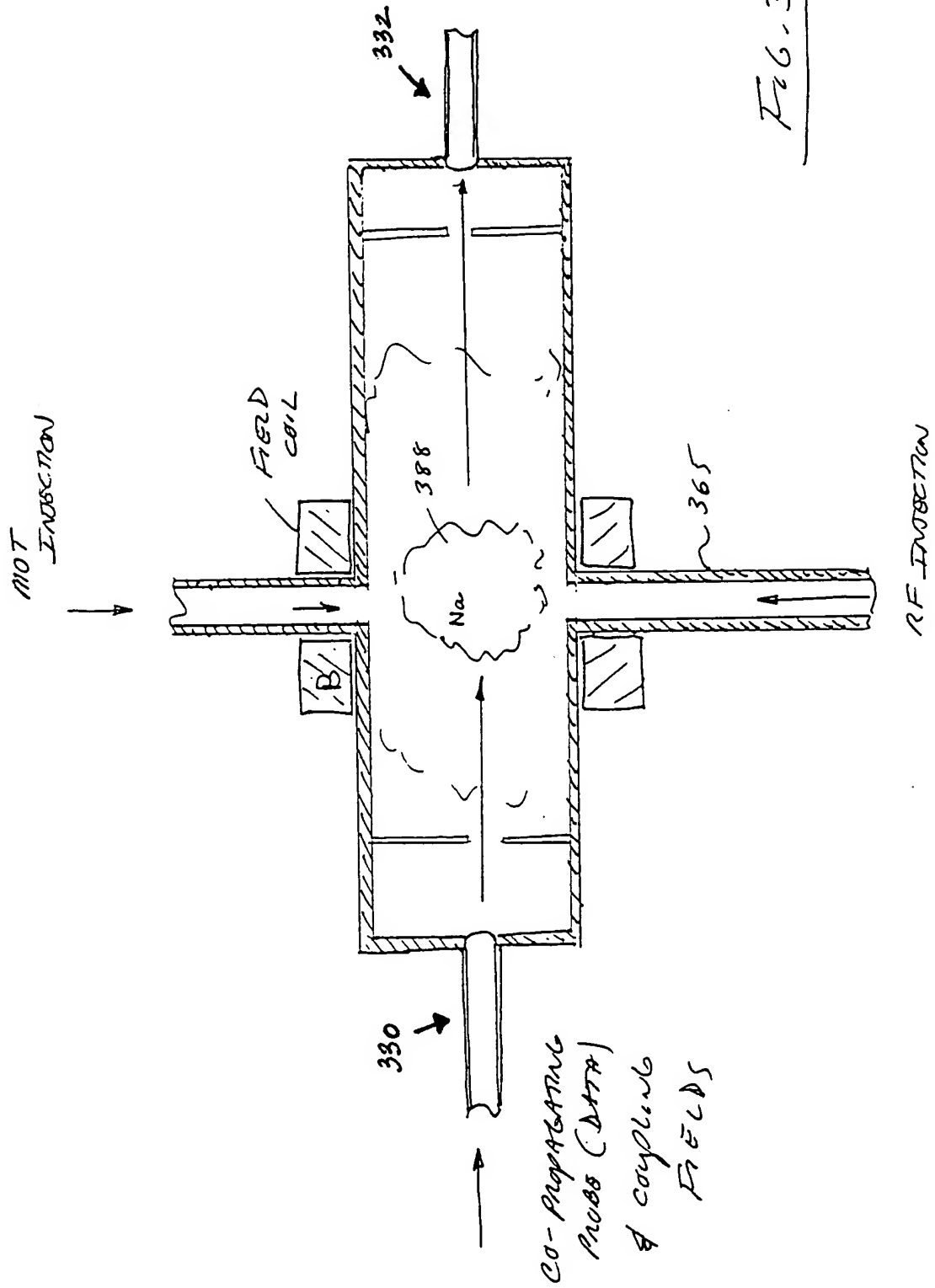
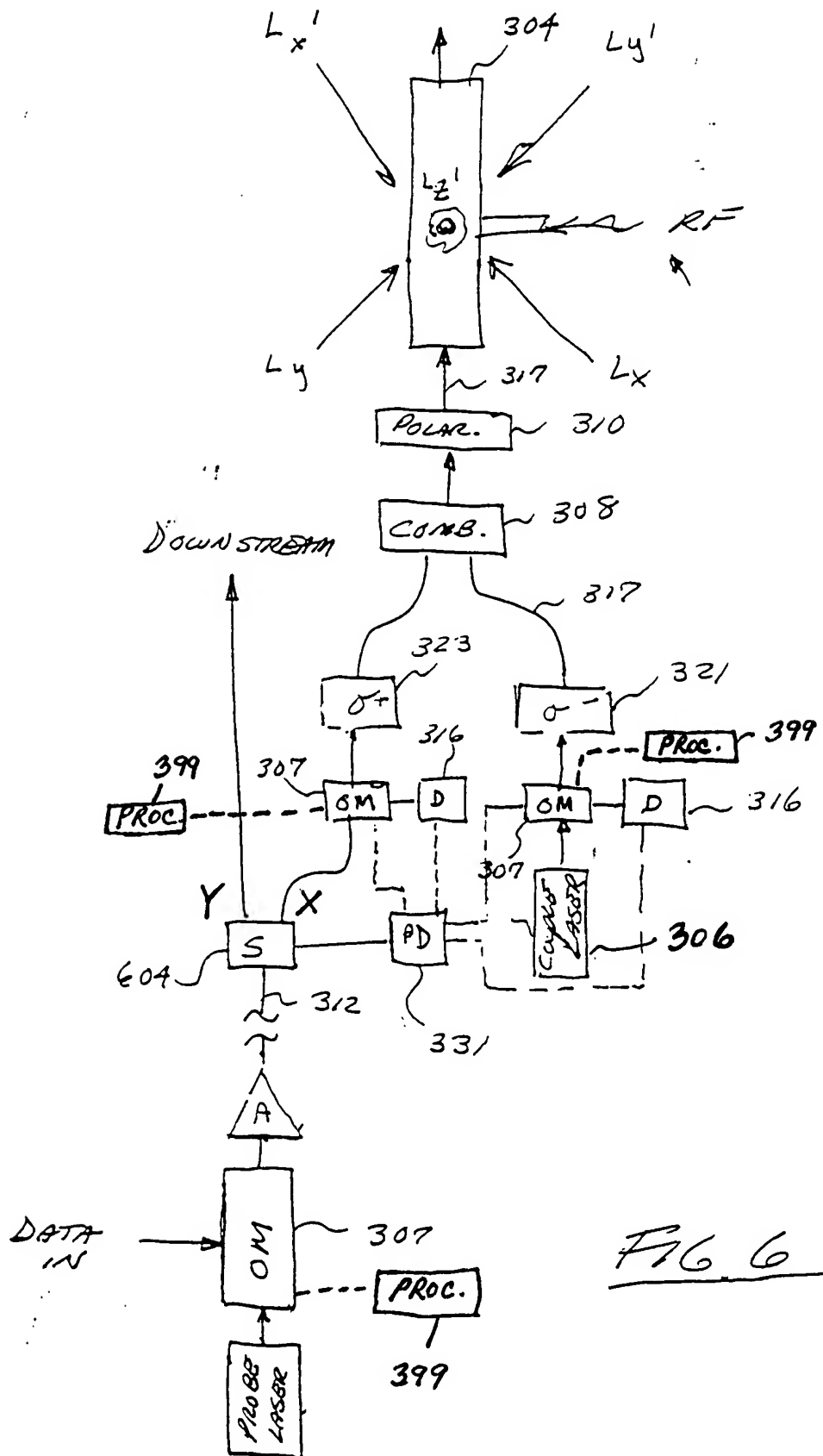


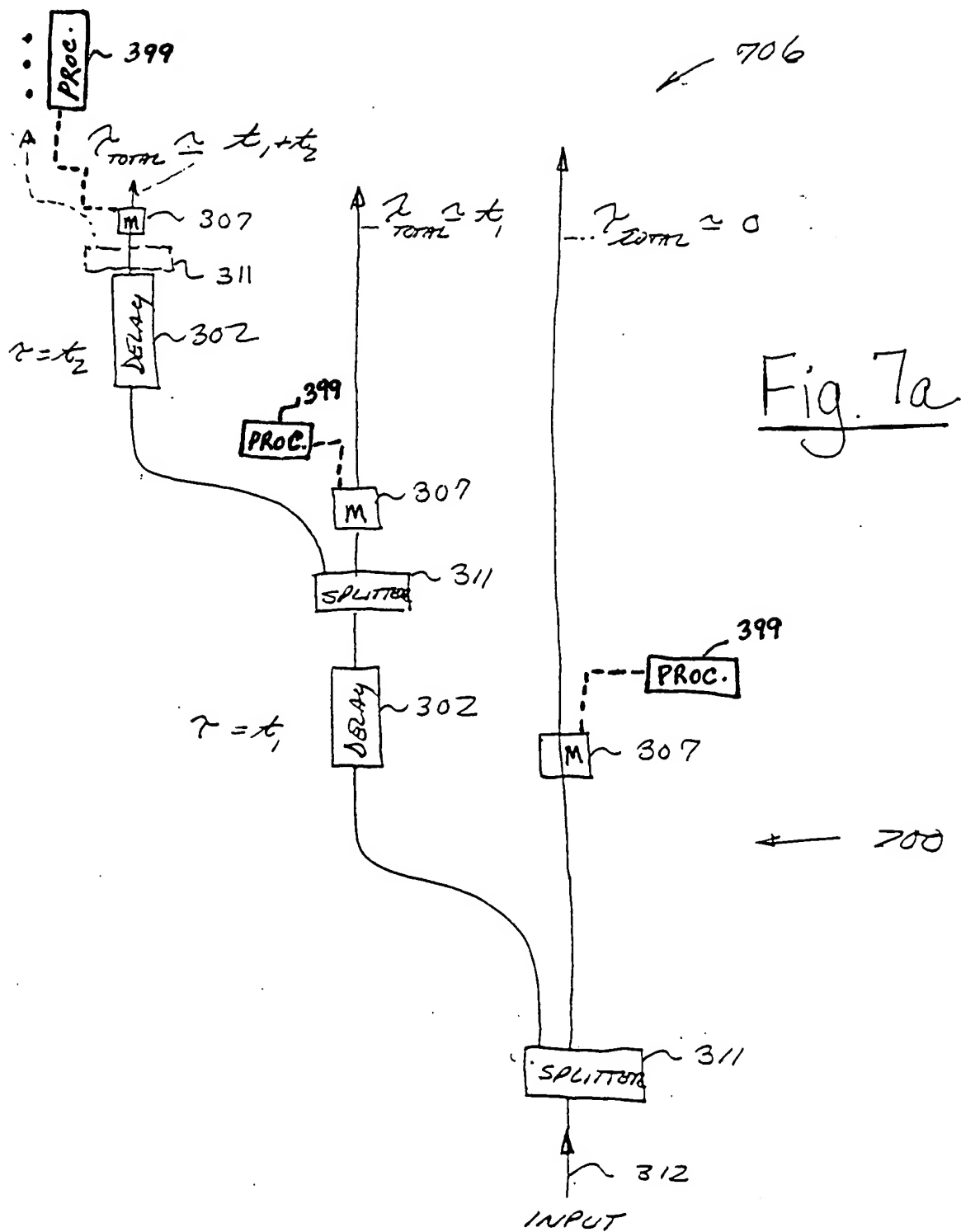
Fig. 3

(PART 1 OF 2)









# ANNOTATED SHEET

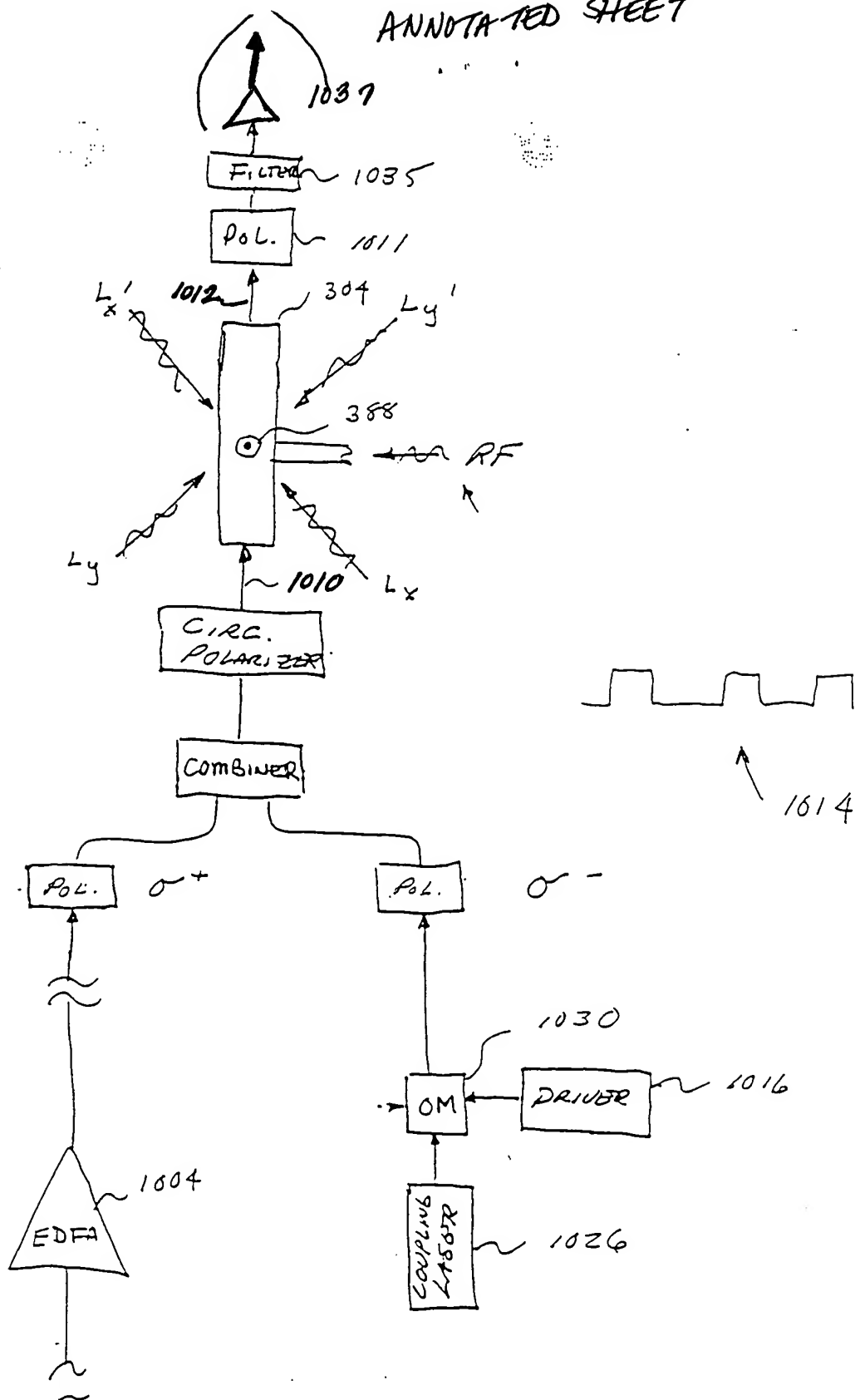
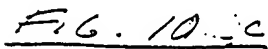


FIG. 10b

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INBOUND  
EDGE OF  
CLOUD

OUTBOUND  
EDGE OF  
CLOUD